

REMARKS

No claims have been amended, canceled, or added. Thus, claims 29-46 are pending in the application.

ALLOWABLE SUBJECT MATTER

Applicants acknowledge that claims 33, 38, and 43 were objected to as being dependent upon rejected base claims, but would be allowable if rewritten in independent form. Applicants respectfully assert that the rejection of the independent claims from which they depend is overcome, meaning these claims are allowable as currently written.

REJECTIONS UNDER 35 U.S.C. § 101

Claims 29-46 were rejected under 35 U.S.C. § 101 because the claimed invention is purported to be directed to non-statutory subject matter. Applicants submit that these claims recite statutory subject for at least the following reasons.

Claim 29 recites the following:

receiving a multimedia signal having data values;
forming the data values into a matrix of inputs [X];
forming a matrix [A] of predetermined values and multiplication operations;
factoring [A] into a butterfly matrix [B], a shuffle matrix [S], and a multiplication matrix [M], wherein the multiplication operations are selectively positioned into pairs within [M]; and
executing a Single Instruction Multiple Data (SIMD) instruction that multiplies [X], [B], [S], and [M] together **to obtain a matrix of outputs [Y]**.

Independent claims 34 and 39 similarly recite receiving a multimedia signal having data values and performing operations to obtain a matrix of outputs [Y].

The Office Action states on page 2 that “for such a claim to be statutory, the claim must include either a practical application at useful end or a discrete, useful, and tangible result(s).”

As Applicants have understood, a claim recites statutory subject matter when it recites a

process . . . that requires the measurements of physical objects or activities to be transformed outside of the computer into computer data where the data comprises signals corresponding to physical objects or activities external to the computer system, and where the process causes a physical transformation of the signals which are intangible representations of the physical objects or activities.

MPEP § 2106 IV.b.2(b)(i). The receipt of a multimedia signal results in the measurement of physical objects or activities outside of the computer to generate the multimedia signal. For example, the multimedia signal may represent audio recording or video images. The operations on that signal to obtain a matrix of outputs [Y] transform the representative signal. Therefore, the method recited in the independent claims is a statutory process.

Also, for a statutory process of this type, a practical application in the technological arts must be disclosed in the specification or be such that it would be known to a skilled artisan. MPEP § 1206 IV.B.2(b). Several practical applications of the process are provided in the description of the invention, and one skilled in the art would know of many practical applications. Thus, the claims need not limit the process to a particular practical application. Applicants submit that claims 29, 34, and 39 recite statutory subject matter.

Given that claims 30-33 and 44 depend from claim 29, claims 35-38 and 45 depend from claim 34, and claims 40-43 and 46 depend from claim 39, Applicants submit that claims 30-33, 35-38, and 40-46 also recite statutory subject matter. Thus, Applicants respectfully submit that claims 29-46 recite statutory subject matter and meet the requirements of 35 U.S.C. § 101.

REJECTIONS UNDER 35 U.S.C. § 103

Claims 29-32, 34-37, and 39-42 were rejected under 35 U.S.C. § 103(a) as being unpatentable over the article "A New Flexible Architecture for Variable Length DC Targeting Shape-Adaptive Transform, IEEE Publication 0-7803-5041-3/99, pages 1949-1952, published in 1999, of Thuyen Le and Manfred Glesner (hereinafter "Thuyen Le") in view of U.S. Patent No. 6,687,724 of Mogi et al. (hereinafter "Mogi"). Applicants submit that these claims are not rendered obvious by the cited references for at least the following reasons.

Claim 29 recites the following:

receiving a multimedia signal having data values;
forming the data values into a matrix of inputs [X];
forming a matrix [A] of predetermined values and multiplication operations;

factoring [A] into a butterfly matrix [B], a shuffle matrix [S], and a multiplication matrix [M], wherein the multiplication operations are selectively positioned into pairs within [M]; and

executing a Single Instruction Multiple Data (SIMD) instruction that multiplies [X], [B], [S], and [M] together to obtain a matrix of outputs [Y].

Independent claims 34 and 39 similarly recite factoring a matrix [A] into a butterfly matrix [B] and other matrices.

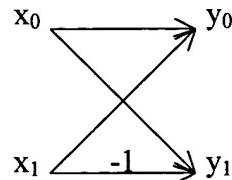
The Office Action cites Thuyen Le as disclosing a butterfly matrix. Specifically, matrix [F] of the cited reference is explained at page 1950. The Office Action states on page 6 that “claims 29, 34, and 39 do not detail or define the structure of the butterfly matrix. Thus, the cited matrix $F_{10 \times 4}$ clearly meets the limitation of the butterfly matrix.” Applicants respectfully submit that one skilled in the art would understand the form of a butterfly matrix, making it unnecessary to recite its particular structure in the claims. A butterfly matrix performs a butterfly operation on a set of given input. An example of a butterfly operation takes two inputs (x_0, x_1) and yields two outputs (y_0, y_1) , where $y_0 = x_0 + x_1$ and $y_1 = x_0 - x_1$. Thus the 2×2 butterfly matrix is

$$\begin{bmatrix} 1 & 1 \\ 1 & -1 \end{bmatrix}$$

because

$$\begin{bmatrix} x_0 + x_1 \\ x_0 - x_1 \end{bmatrix} = \begin{bmatrix} 1 & 1 \\ 1 & -1 \end{bmatrix} \begin{bmatrix} x_0 \\ x_1 \end{bmatrix}.$$

The operation can be drawn as



Similarly, examples of 3×3 and 4×4 butterfly matrices are

$$\begin{bmatrix} 1 & 0 & 1 \\ 0 & 1 & 0 \\ 1 & 0 & -1 \end{bmatrix} \text{ and } \begin{bmatrix} 1 & 0 & 0 & 1 \\ 0 & 1 & 1 & 0 \\ 0 & 1 & -1 & 0 \\ 1 & 0 & 0 & -1 \end{bmatrix},$$

respectively. As Applicants have understood the reference, Matrix [F] fails to perform a butterfly operation. Although Thuyen Le states that the assignment of γ in [F] is arbitrary, **no γ can be applied to allow [F] to perform a butterfly operation**. Thus, Applicants submit that [F] fails to disclose or suggest a butterfly matrix. Furthermore, Applicants respectfully point out

that butterfly matrices are square matrices. [F] is a 10x4 matrix, which is not a square matrix. Thus, Thuyen Le does not disclose the use of a butterfly matrix as asserted in the Office Action.

Mogi fails to cure the deficiencies of Thuyen Le. The Office Action cites Mogi as disclosing the use of Single Instruction Multiple Data (SIMD) instruction. Whether or not Mogi discloses the use of SIMD instruction, it does not disclose factoring a matrix into a butterfly matrix [B], a shuffle matrix [S], and a multiplication matrix [M].

Thus, whether alone or in combination, the cited references fail to disclose at least one element of the claimed invention, and therefore fail to support an obviousness rejection of the independent claims under MPEP § 2143. Applicants thus submit that the remainder of the claims depend from non-obvious base claims, and therefore are allowable under MPEP § 2143.03 for at least the same reasons as the independent claims.

CONCLUSION

For at least the foregoing reasons, Applicants submit that the rejections have been overcome. Therefore, all pending claims are in condition for allowance, and such action is earnestly solicited. The Examiner is respectfully requested to contact the undersigned by telephone if such contact would further the examination of the present application.

Please charge any shortages and credit any overcharges to our Deposit Account number 02-2666.

Respectfully submitted,
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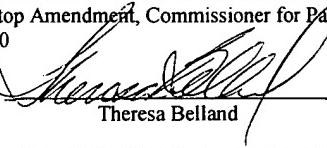
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06/08/06
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